

Track-to-Track Association in a Collective Perception Scenario

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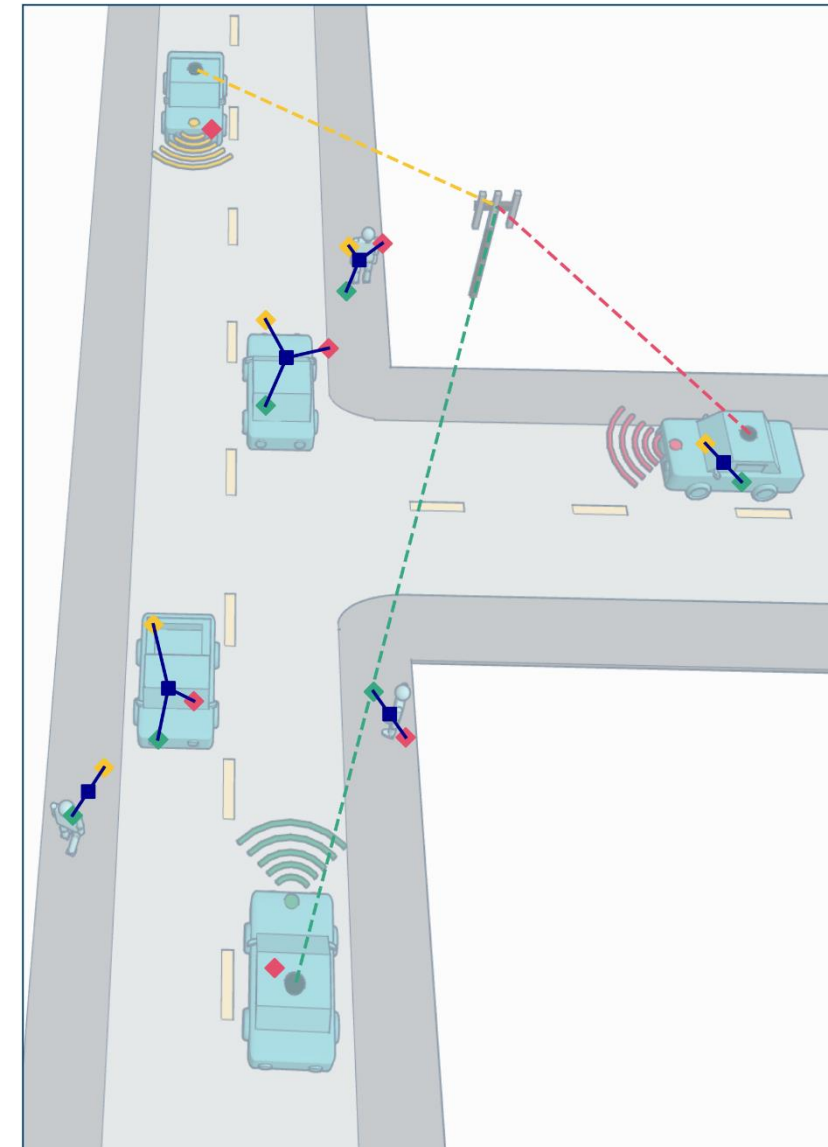
*Joint work with Marcus Baum, Vincent Wolff and Markus Fidler
in the project Zukunftslabor Mobilität*



**DATA
FUSION Lab**



- Autonomous vehicles
 - Track other traffic participants
 - Communicate with road side unit (RSU)
- Collective perception
 - Combine local perception
 - Increase field of view
- Track-to-track association
 - Multi-dimensional assignment problem
 - Cluster cannot contain two tracks from the same sensor



- Challenges for fusion
 - Varying (possibly high) number of sensors
 - Incomplete detection
 - Occlusions
 - Limited field of view for sensors
 - Imperfect communication
 - Packet loss / delay
 - Processing times
- No real world data available
- ➔ need realistic simulation

Our additions

Local tracking
Association and Fusion in RSU

Artery

V2X communication

Sensor detections
Collective Perception messages

SUMO

Traffic Simulation

“realistic” movement of
cars / pedestrians

OMNeT++

Network Simulation

Vehicles



- Track objects in sensor range

- vehicles and pedestrians
- Simplified (no data association)
- Maneuvering objects
- occlusions

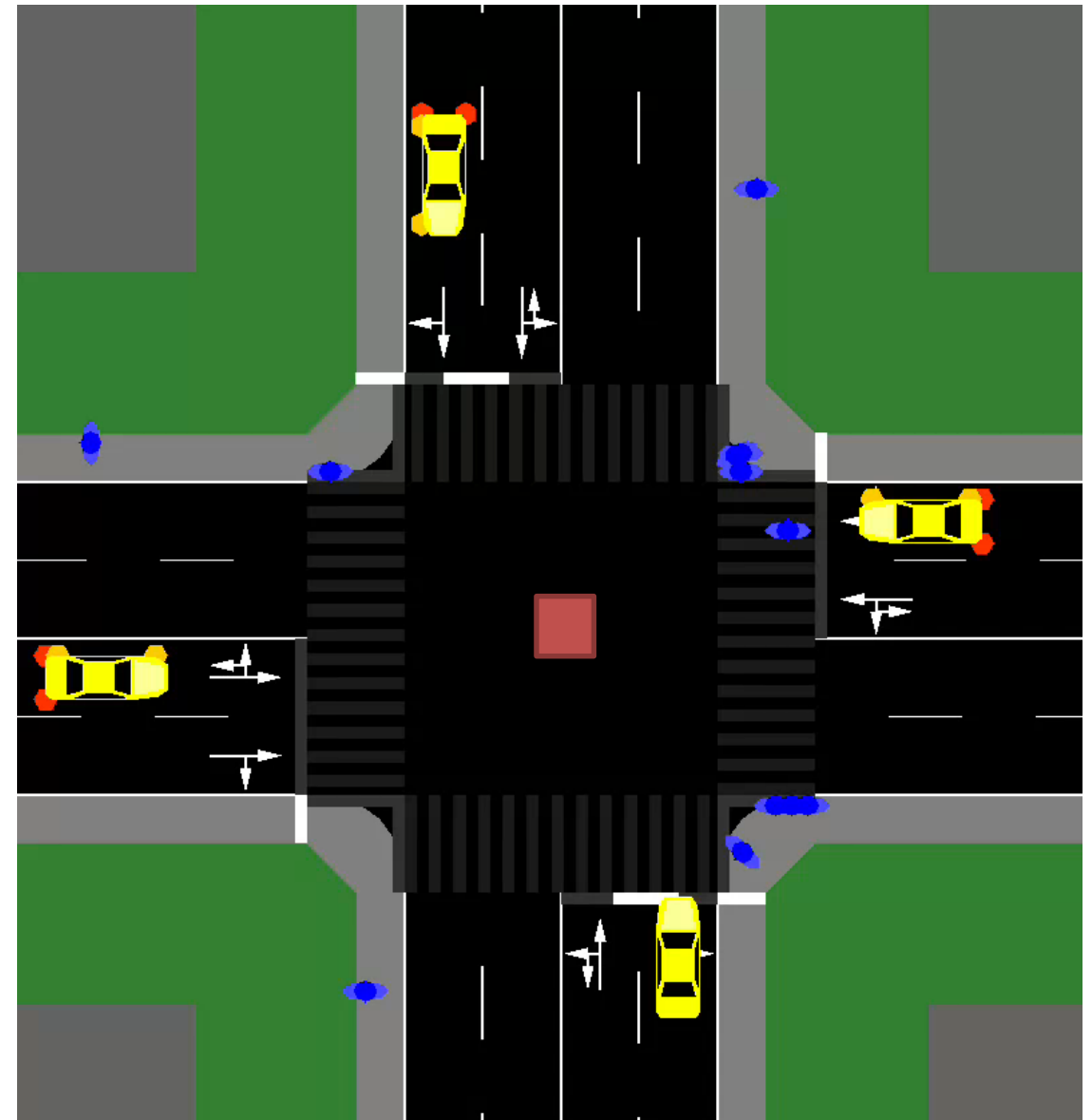


- Send tracks to RSU

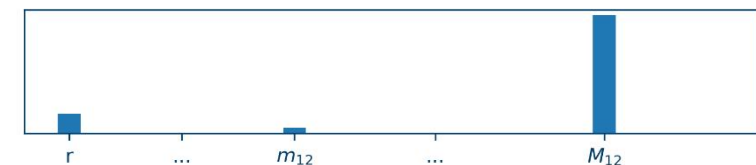
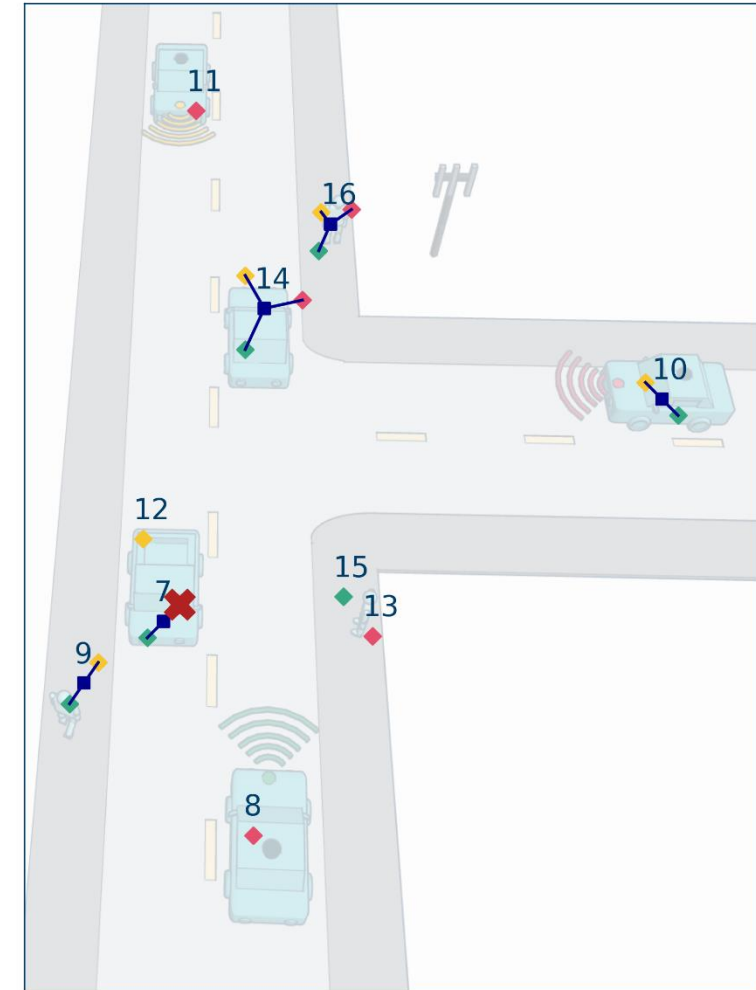
Road Side Unit (RSU)

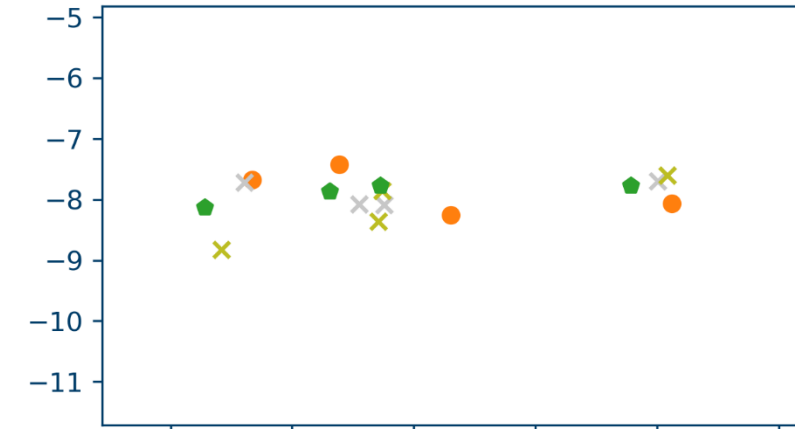
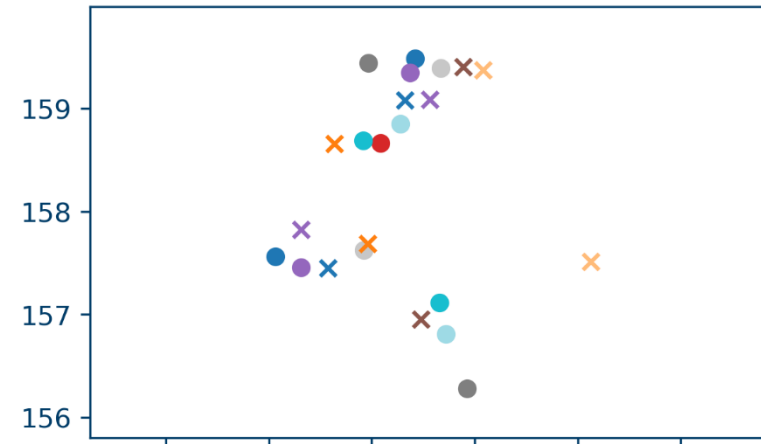


- Decides which tracks belong together
 - High-dimensional assignment problem
 - Stochastic optimization approach
- Fuse tracks together
- (send back to vehicles)



- Sample multiple possible associations
- Assign tracks to clusters
- Based on likelihood
- Iterate through the tracks
 - Calculate likelihood of actions
 - Sample and perform action
 - Remain in current cluster (r)
 - Create singleton (s)
 - Move to other cluster (m)
 - Merge with other cluster (M)





- Real world-like simulation
- Track-to-track association
- Collective perception

Open questions:

- Detect double / clutter tracks
- Influence of communication rules

Source code (track-to-track association):

<https://github.com/Fusion-Goettingen>

➔ Questions?

